



PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE  
HISTORY STAGES OF BELONIFORM FISHES OF THE WESTERN CENTRAL  
NORTH ATLANTIC

BY

B. B. Collette



U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Southeast Fisheries Science Center  
75 Virginia Beach Drive  
Miami, FL 33149

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U.S. DEPARTMENT OF COMMERCE  
Donald L. Evans, Secretary

National Oceanic and Atmospheric Administration  
Conrad C. Lautenbacher, Jr., Under Secretary for Oceans and Atmosphere

National Marine Fisheries Service  
William T. Hogarth, Assistant Administrator for Fisheries

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It will be a chapter entitled Order Beloniformes in the "Guide to the early life history stages of fishes of the western central North Atlantic".

Author's address:

NOAA Fisheries  
Systematics Laboratory  
Northeast Fisheries Science Center  
Smithsonian Institution  
P. O. Box 37012  
Washington, DC 20013-7012  
[bruce.collette@noaa.gov](mailto:bruce.collette@noaa.gov)

Copies may be obtained by writing:

The authors or

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## ORDER BELONIFORMES

By B. B. Collette

The Beloniformes (or Synentognathi) is an order of atherinomorph fishes containing two suborders, five families, 37 genera, and at least 220 species (Rosen and Parenti 1981; Collette et al. 1984). Species of Adrianichthyoidei are restricted to Asian fresh and/or brackish waters.

Representatives of all four families of Exocoetoidei are found in the west central Atlantic: Belonidae - 4 genera, 7 species; Exocoetidae - 7 genera, 15 species; Hemiramphidae - 5 genera, 9 species; and Scomberesocidae - 1 genus, 1 species (Carpenter 2003). Features common to the suborder Exocoetoidei include dorsal and anal fins on the rear half of the body, abdominal pelvic fins with six soft rays, no fin spines, lateral line running along the ventral edge of the body, an open nasal pit, and lower pharyngeal bones fused into a triangular plate (leading to the name Synentognathi). Recent molecular research (Lovejoy 2000) indicates a different grouping of genera than the classic four families recognized here, e.g. sauries with *Belone* and *Petalichthys* of the Belonidae, Zenarchopterinae with other needlefishes rather than the rest of the Hemiramphidae, etc. Most species of the four families are tropical epipelagic marine fishes, but several genera of Belonidae and Hemiramphidae are restricted to freshwaters and a few other genera contain estuarine and freshwater as well as marine species

Development has long been of interest in exocoetoid fishes (Schlesinger 1909; Nichols and Breder 1928; Collette et al. 1984; Lovejoy 2000). Most beloniform fishes produce large spherical eggs with attaching filaments, characters they share with other atherinomorph fishes (Rosen and Parenti 1981). Freshwater and estuarine genera of halfbeaks in the Asian subfamily

Zenarchopterinae practice internal fertilization and three genera are viviparous (Meisner and Collette 1999). Adrianichthyid eggs are the smallest (1.0-1.5 mm in diameter), followed by exocoetids (generally 1.5-2.0 mm), Hemiramphidae (typically 1.5-2.5 mm), Scomberesocidae (slightly elliptical, 1.5-2.5 mm), and belonid eggs which are generally the largest (most 3.4 mm). The eggs typically have a homogeneous yolk and a relatively small perivitelline space. The incubation period is relatively long in exocoetoids (Kovalevskaya 1982). Belonids hatch at the largest sizes (6.8-14.4 mm), followed by halfbeaks (4.8-11 mm), sauries (at least as small as 6.0-8.5 mm), flyingfishes (3.5-6.1 mm), and adrianichthyids (3.5-4.5 mm) (Collette et al. 1984). Fin formation generally begins during the embryonic stages or soon after hatching. Caudal, dorsal and anal fins generally form first followed by the pectorals and lastly the pelvics (except in exocoetids where the pectorals form last). During post-embryonic development, exocoetoids undergo complex changes in barbel development, beak length, melanistic dorsal fin lobe, body bars, and pelvic fin pigmentation and these features are important both in phylogeny and identification of species. The lower jaw forms a beak in juveniles of some species of all 4 families of Exocoetoidei but disappears with growth in the Exocoetidae, remains an elongate beak in most Hemiramphidae, and is joined by an elongate upper jaw in most Belonidae and in Scomberesox in the Scomberesocidae.

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